## REMARKS

An RCE is filed herewith. Entry of the 3/22/2007 Amendment and the present Amendment is requested.

Responsive to the 4/2/2007 Advisory Action, a copy of JP2001 203182 is enclosed. Claims 1 and 25 have been amended to include controlling the thickness of the liquid layer, as discussed at 0048.

1. The Section 112(1) Rejections:

As set forth at page 2 of the 2/22/2007 Final Office Action, Claims 1-10, 12-14, 17, 20, 22 and 24 are rejected under Section 112(1) on the basis that the specification as originally filed does not provide support for "forming a boundary layer of a heated liquid on the bottom surface of the workpiece." Reconsideration and withdrawal of this Section 112(1) rejection is requested. The following arguments, which were included in the 3/22/2007 Amendment. In the 4/2/2007 Advisory Action, the Examiner noted that these arguments "may be persuasive".

The claim language "forming a boundary layer of a heated liquid on the bottom surface of the workpiece" is in independent claim 1. Claims 2-10, 12-14, 17, 20, 22 and 24 are all dependent claims depending from claim 1, and are consequently rejected for this reason. None of these dependent claims is separately rejected under Section 112(1).

Applicant submits that "forming a boundary layer of a heated liquid on the bottom surface of the workpiece" is well supported in the Application as filed, at the following locations.

Original Claim 1 reads:

"1. A method for cleaning a flat media workpiece comprising the steps of:

forming a boundary layer of a heated liquid on the workpiece;

providing ozone into the environment around the workpiece; and

directing a jet liquid through the boundary layer to physically dislodge a contaminant on the workpiece."

Original Claim 23 reads:

"23. The method of claim 1 where the workpiece has a top surface and a bottom surface, and where the jet is directed from below against the bottom surface."

Hence, original claim 1 describes a flat workpiece, forming the boundary layer on the workpiece, and directing a jet through the boundary layer. Original claim 23 describes the workpiece as having a top surface and a bottom surface, and with the jet directed against the bottom surface. Accordingly, in the method of original claim 23, the boundary layer is necessarily formed on the bottom surface (since in original claims 1 and 23 the jet is necessarily directed through the boundary layer, and the jet is directed at the bottom surface).

The original specification also supports claiming "forming a boundary layer of a heated liquid on the bottom surface of the workpiece."

Paragraph 0107 specifies that the <u>jet penetrates through the boundary layer:</u>

"[0107] Referring to Fig. 7, another alternative system 120 is similar to the system 54 shown in Fig. 4, except the system 120 does not use the spray nozzles 40. Rather one or more jet nozzles 56 are used to form a high pressure jet of liquid. The liquid 58 formed into the high pressure jet

62 penetrates through the boundary layer 73 of liquid on the workpiece surface...." (emphasis added).

Paragraph 0019 states that:

"[0019] "...The nozzle may be above or below, or to one side of the workpiece so that the jet travels vertically up or down, or horizontally. Ozone is supplied into the chamber and diffuses through the boundary layer, to remove contaminants." (emphasis added).

Again, since the jet is directed through the boundary layer, this paragraph supports forming the boundary layer on the top or the bottom surface.

Paragraph 0038 states that:

"[0038] One or more nozzles 40 are disposed within the process chamber 15 to direct a spray mixture of ozone and liquid onto the surfaces of the workpiece 20. The nozzles 40 preferably direct a spray of liquid to the underside of the workpiece 20...." (emphasis added).

Since the spray forms the boundary layer, this paragraph supports forming the boundary layer on the bottom surface.

Withdrawal of the Section 112(1) rejections is requested.

2. The Rejections Over Prior Art:

Turning to the rejections at pages 3-5 of the 2/22/2007 Final Office Action, Torek et al., US Patent No. 6,645,874 B1, does not suggest any use of liquid jet as claimed. Torek et al. also teaches away from fast spinning, on the basis that it poses a significant risk of damage to the workpiece. Col. 1, line 65 – Col. 2, lines 1-6. Accordingly, Torek et al. specifies slow rotation, approximately 100 rpm or less, to provide a uniform

boundary layer. Col. 3, lines 27-30 and Col. 9, lines 15-20. This slow rotation is performed with the wafer in a vertical orientation, as shown in Figs. 3 and 5 of Torek et al. In addition, Torek et al. is a batch process, with the workpieces held in a cassette (element 85 in Figs. 3 and 5). Col. 6, lines 60-68; Col. 7, lines 16-20; Col. 8, lines 60-64. A pulsing spray is optionally used in Torek et al. to remove chunks of photoresist. Col. 4, lines 48-67.

DeGendt et al., US 2002/0011257 A1, discloses tank processes with a stationary substrate. Spinning and spraying do not appear to be used. As with Torek et al., there is no liquid jet. As with Torek et al., the substrates are vertically oriented.

Sasaki et al., US Patent No. 5,785,068, describes a high pressure pinpoint liquid spin process. The pinpoint liquid is provided only at an inclination angle, not substantially perpendicular to the substrate. The pinpoint liquid is applied to the top surface of the substrate. The Sasaki et al. apparatus cannot process the bottom surface of the substrate. The pinpoint liquid directed at an angle to the substrate is apparently intended to remove particles directly via the pinpoint liquid. No chemical cleaning, such as the claimed use of ozone, is suggested.

Boyers et al., US Patent No. 6,982,006 is cited at page 4 of the 2/22/2007 Office Action as disclosing directing a liquid <u>jet</u> at the bottom surface of a spinning workpiece. However, no <u>jet</u> is mentioned in Boyers et al. In each instance, Boyers et al. discloses a spray. While the discussion of Fig. 6 in Boyers et al. refer to moving spray heads, (referred to e.g., a dishwasher rotating spray arms) there is no suggestion of a jet nozzle, or physically dislodging contamination.

Turning now to the 4-way combination of Torek et al., DeGendt et al., Sasaki et al., and Boyers et al., initially, the Sasaki et al. is the only reference disclosing use of a

liquid jet. However, Sasaki et al. does not suggest a chemical cleaning (or ozone) step, or a jetting up from below step, as claimed. Boyers et al. discloses spraying a bottom surface, but no jet. Moreover, the difference between the 4-way combination of prior art and these claims is more than just directing the jet onto a top surface or a bottom surface. Claims 1 and 26 include forming a layer of liquid on the bottom surface in combination with directing the jet at the bottom surface. Forming the liquid layer on the bottom surface is not disclosed in any of the references. It is also not suggested because with the liquid layer on the bottom surface, gravity works against maintaining the liquid layer in place. Claims 1 and 25 include controlling the thickness of the layer of liquid. As set forth at 0048, the thickness of the liquid layer affects how much ozone diffuses through the liquid layer to react at the wafer surface. None of the four references applied in combination suggest controlling the liquid layer, as claimed. Sasaki et al. discloses spraying low pressure water towards the center of the workpiece from side nozzles 6, but there is no mention of forming a liquid layer, or controlling thickness of a liquid layer.

Regarding claims 4 and 42, Sasaki et al. consistently, and apparently necessarily, discusses use of the pinpoint liquid only at an angle. The horizontal velocity component of the pinpoint liquid is apparently used in Sasaki et al. to carry away particles. Sasaki et al. does not disclose any perpendicular pinpoint liquid orientation. The Sasaki et al. apparatus also does not appear to be able to achieve a perpendicular orientation. There is also nothing in Sasaki et al. suggesting that the jet penetrates through a liquid layer. Indeed, with the jet at an angle, penetration would be more difficult.

Relative to claim 3 which includes pressures of 500-2000 psi, Sasaki et al. discloses a pressure of at least 30 kg/sq. cm, or 426 psi.

Taken in perspective, Torek et al.; DeGendt et al. and Boyers et al. are each chemical cleaning references disclosing ozone. These references are entirely silent on physical cleaning. Sasaki et al. stands alone as a physical cleaning reference, but does not suggest any chemical cleaning step. Finally, there is no motivation shown anywhere to combine either of Torek et al. or DeGendt et al. with Sasaki et al. Torek et al. and DeGendt et al. describe only purely chemical cleaning. They teach away from a combination with a liquid jet because they are tank processes. See Fig. 3 in Torek et al. and Figs. 3 and 8 in DeGendt et al. Torek et al. and DeGendt et al. are both physically and conceptually not consistent with or adaptable for use with a liquid jet. Moreover, based on the content of these references, there would be no reason to combine either one with the other, or with a pinpoint liquid reference such as Sasaki et al.

In view of the foregoing, it is submitted that the claims are in condition for allowance. A Notice of Allowance is requested.

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